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Planned R&D Expenditures

of

Major U.S. Firms: 1990-91

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Surveys of Science Resources Series
National Science Foundation

Special Report
NSF 91-306

Planned R&D Expenditures

of

Major U.S. Firms: 1990-91

Authors: John R. Gawalt and Howard H. Garrison

Surveys of Science Resources Series
National Science Foundation

Special Report
NSF 91-306

Suggested Citation

National Science Foundation, Planned R&D Expenditures of Major U.S. Firms: 1990-91, Special Report, NSF 91-306 (Washington, D.C., 1991).

Availability of Publications

Single copies may be obtained gratis from the National Science Foundation, Washington, D.C. 20550.

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Acknowledgments

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Contents

Page

General Notes vii

Executive Summary ix

Introduction 1

Survey Findings and Interpretations 3

  R&D Spending Plans for 1990 3

  R&D Spending Plans for 1991 5

  Planned R&D Expenditures Abroad 7

  Impact of Current Events in Eastern Europe 8

  Impact of Changes in Defense Spending 9

Technical Ntes 11

  Data Collection 11

  Response Rates and Nonresponse Analysis 12

Appendixes:

  A. Definitions of Industry Groups................ 19

  B. Survey Documents 23

General Notes

This report is based on information obtained via telephone interviews with 144 corporate officials representing the Nation's companies that perform the largest amount of research and development (R&D). The interviews were conducted during a three-week period from mid-September to early October 1990. Because actual 1990 R&D expenditure data were available for just a few firms at the time of the interviews, R&D figures given in this report for 1990 represent planned expenditures only.

Of the 144 firms that responded to this survey, 105 operate on fiscal years ending in December and the remaining 39 operate on fiscal years that end in other months. Therefore R&D expenditure data in this report are generally referred to by calendar year, and such references are not precise.

Executive Summary

Of the 144 firms that provided the data on which this report was based, a large majority reported plans to increase domestic R&D expenditures during 1990.

- Together, the responding firms reported plans to increase domestic R&D expenditures by 3.9 percent for 1990, a decrease of 0.3 percent in constant-dollar terms.
- The number of firms reporting growth exceeded the number of firms reporting declines in every industry except aircraft and missiles.
- The industrial and other chemicals industry plans the greatest increase in domestic R&D expenditures, 9.7 percent, followed by computer services at 8.9 percent.
- Planned domestic R&D expenditures declined by 3.0 percent in the aircraft and missiles industry, the only industry to report a drop in R&D expenditures.

A majority of the firms responding to the survey also predicted growth in domestic R&D expenditures during 1991.

- Together, the responding firms predicted a 4.3 percent rise in domestic R&D expenditures for 1991, a decline of 0.1 percent in constant-dollar terms.
- Forecasts of growth exceeded forecasts of decline in every industry except aircraft and missiles.
- The firms in the pharmaceutical industry forecast the largest increases in domestic R&D expenditures for 1991--8.0 percent. Computer services firms projected the second highest growth--7.0 percent--followed closely by firms in the petroleum refining and extraction industry, 6.7 percent.
- The only industry that expected a decline in 1991 domestic R&D expenditures was the aircraft and missiles industry, in which the R&D expenditures of responding firms were projected to be 1.7 percent lower.

The fraction of the total corporate R&D budget allocated to foreign laboratories is estimated to have increased from 11 percent to 16 percent over the 1985-89 period for the 52 firms operating both foreign and domestic R&D facilities.

Almost one-quarter of the responding firms expected to increase the level or alter the direction of their R&D activities in 1991 in response to new economic opportunities in Eastern Europe. Many of the remaining firms planned to increase marketing activities first, and then adjust their R&D activities.

Introduction

This study was conducted in response to a request from the National Science Board's Committee on Industrial Support for Research and Development. The Committee's primary need was for data on corporate R&D spending plans for 1990 and 1991 and for an insight into the major factors influencing these plans. In addition to obtaining information on R&D spending plans, corporate insight was sought regarding 1) changes in the distribution of corporate funding between domestic and foreign R&D laboratories, 2) the potential impact of recent developments in Eastern Europe on 1991 R&D funding, and 3) the expected changes in company-supported, defense-related R&D.

Information on these topics was collected via a telephone survey of the Nation's 200 largest R&D-performing companies, as measured by their total R&D expenditures during 1989. Also contacted were 19 firms that were engaged in substantial R&D activity and that had previously participated in NSF industry panels. Interviews began September 17 and were completed by October 5, 1990. Representatives of all 219 companies were contacted, and 144 interviews were completed for an overall survey response rate of 65.8 percent. The 144 company officials interviewed represented companies with domestic R&D budgets totaling $41.8 billion in 1989, approximately 60 percent of all company-funded R&D performed in the United States. Officials representing 15 of the 20 largest R&D-performing companies were successfully interviewed. A more complete discussion of the characteristics of companies contacted is provided in the Technical Notes section of this report.

Survey Findings and Interpretations

R&D Spending Plans for 1990

A large majority of the respondents reported that their firms planned to increase domestic R&D expenditures during 1990. Of the 130 firms able to report domestic R&D data for both 1989 and 1990, 86 expected that levels of domestic R&D would increase from 1989 to 1990 (table 1). Not all firms anticipated such an increase: 24 planned no change and another 20 firms planned declines. When total domestic R&D expenditures for all 130 firms in 1989 were compared to those planned for 1990, the increase in current-dollar terms was 3.9 percent. After adjusting for inflation, however, this increase translates into an overall decrease of 0.3 percent.

The number of firms planning growth in domestic R&D expenditures exceeded the number of firms planning declines in every industry except one, aircraft and missiles. When changes in R&D expenditures were calculated on a dollar basis, firms projected growth in R&D expenditures in all industries except aircraft and missiles. The industrial and other chemicals, and computer services industries expected the largest percentage growth (9.7 percent and 8.9 percent, respectively). Respondents in the aircraft and missiles industry anticipated an overall decrease of 3.0 percent in domestic R&D. [Definitions of the industry classifications are presented in appendix A.]

Company officials gave a variety of reasons for the change in their firms' domestic R&D expenditure levels, and most reported more than one reason. Strategic choices relating to company plans and goals were the most commonly cited reasons for increasing R&D expenditures. Over two-fifths of the 86 firms with rising R&D expenditures gave this response. Respondents cited management's general belief in the importance of R&D; competition led other firms to increase R&D. Some companies chose to increase R&D as a matter of long-term strategy to consolidate or expand their position in certain areas. Increased R&D was often part of a program of diversification into new market areas or production processes.

Closely related to the strategic plans previously referred to, 30 of the 86 firms with expanding R&D attributed their growth to new technologies or products. Many of the largest shifts were due to the development of new products.

Inflationary pressure was the second most common reason given for increasing R&D expenditures. After adjusting for these pressures, total R&D expenditures are expected to remain relatively constant. Of the 86 firms with plans for higher domestic R&D spending in 1990 than in 1989, 33 reported inflation

Table 1. Projected changes in domestic R&D expenditures: 1989-90

		Number of firms reporting			
Industry	Total	Growth	No change	Decline	Percent change in R&D[1]
Total	130	86	24	20	3.9%
Petroleum refining and extraction	8	7	1	0	5.1
Industrial and other chemicals	25	20	3	2	9.7
Pharmaceuticals	8	6	0	2	6.6
Computer and office equipment	5	3	0	2	1.8
Other machinery	5	3	2	0	6.7
Electrical equipment	16	9	4	3	6.7
Aircraft and missiles	14	4	4	6	-3.0
Scientific instruments	17	12	2	3	1.7
Computer services	6	5	0	1	8.9
Other industries	26	17	8	1	3.9

[1] Calculations based on dollar-value estimate of domestic R&D expenditures.

SOURCE: National Science Foundation, SRS

as one of the reasons. Rising personnel costs were mentioned by several firms.

Higher R&D costs due to changing technology or increased regulation were also given as reasons for increased expenditures. Several companies reported that the cost of negotiating the regulatory process had risen. Increases in the regulatory processes connected with clinical studies have compelled pharmaceutical firms to increase their R&D expenditures. Expanded testing for pharmaceuticals and other products has also stimulated R&D in the scientific instruments industry. Some companies in petroleum refining and extraction and other industries also noted that environmental regulations were partially responsible for growth in their R&D expenditure plans.

In many cases changes in R&D expenditures were directly market driven. Over one-fourth of the firms planning to increase expenditures based their decisions on expected changes in sales or profit levels. In several cases organizational factors were also responsible for changing R&D levels. Some firms reporting plans for a large annual increase were established firms that had recently acquired a smaller, high technology company.

The reasons given for decreasing R&D expenditures were less varied than the reasons for increases. Of the 20 firms reducing R&D expenditures, 9 cited sales and profit levels as a factor behind the decision. Companies spending less on R&D sometimes mentioned pressure to increase short-term profitability. Several firms in the aircraft and missiles industry expected to reduce R&D because they anticipated decreases in Federal defense spending. Acquisitions, mergers, and restructuring were also mentioned by seven firms as factors leading to reduced R&D spending. In some firms, total R&D expenditures dropped because major R&D projects had been recently completed.

R&D Spending Plans for 1991

Patterns and levels of growth in domestic R&D expenditures planned for 1991 are similar to those reported for 1990. Of the 112 firms able to supply information for 1990 and 1991, 74 anticipated that domestic R&D expenditures would increase (table 2). Only 10 firms expected domestic R&D expenditures to decline in 1991, and the 28 other companies project no change. When projected R&D expenditures for 1991 were compared to those for 1990, total domestic R&D expenditures were expected to rise by 4.3 percent. Converting to constant-dollar terms yields a planned decrease of 0.1 percent.

Expenditure plans for 1991, like those for 1990, varied substantially across industrial groups. Although aircraft and

Table 2. Projected changes in domestic R&D expenditures: 1990-91

Industry	Number of firms reporting: Total	Growth	No change	Decline	Percent change in R&D[1]
Total	112	74	28	10	4.3%
Petroleum refining and extraction	7	6	1	0	6.7
Industrial and other chemicals	23	18	4	1	5.7
Pharmaceuticals	8	7	0	1	8.0
Computer and office equipment	5	3	1	1	4.0
Other machinery	3	2	1	0	3.8
Electrical equipment	11	7	3	1	3.4
Aircraft and missiles	12	3	7	2	-1.7
Scientific instruments	15	11	2	2	2.8
Computer services	6	5	1	0	7.0
Other industries	22	12	8	2	6.0

[1] Calculations based on dollar-value estimate of domestic R&D expenditures.

SOURCE: National Science Foundation, SRS

missiles was still the only industry group that projected a net decline in domestic R&D for 1991 (-1.7 percent), the industrial and other chemicals industry (5.7 percent) was no longer the leader in terms of growth. Respondents in the pharmaceuticals industry projected 8.0 percent growth in R&D expenditures. Computer services (7.0 percent) and petroleum refining and extraction (6.7 percent) were also among the leaders in terms of anticipated growth.

The reasons given for planned growth or decline in 1991 were similar to those for 1990. Strategic and long-range plans were the most commonly cited reasons. Some of these strategic plans were based on the view that research was necessary to maintain or increase market competitiveness. In other cases, R&D was designed to develop new product lines or enter new market areas.

Rising costs and inflationary pressures were the second most commonly cited reasons for planned growth in R&D expenditures; sales and profit levels were mentioned by a smaller number of respondents. But these were much more likely to be given as reasons for "no change" or decreases in R&D spending. Sales or profit levels was the most frequent response given by representatives of firms projecting stable or declining R&D expenditures. Mergers and reorganizations were also associated with reductions in R&D.

Planned R&D Expenditures Abroad

Of the 144 officials interviewed, 52 (36.1 percent) reported that their companies operated domestic and foreign R&D laboratories during both 1985 and 1989. In 1985, domestic laboratories operated by these 52 firms received an estimated 89 percent of total corporate R&D funding--foreign laboratories received 11 percent. By 1989, this distribution shifted to 84 percent and 16 percent, respectively. Companies are investing a larger portion of their total R&D dollars overseas.

Many of these firms have become more international in their marketing activities and reported growth in foreign sales. Several respondents explained that the character of their firms' foreign R&D activities was solely development because they wanted to ensure that their products met local needs. Others reported that foreign opportunities for growth were stronger than domestic opportunities, and that conducting foreign R&D was an attempt to become more international. Some respondents reported that competition is exceptionally stiff in certain foreign markets, and that additional R&D was needed to protect their position.

Production has also become more international, and some of the increased foreign R&D was the direct result of this shift in location of manufacturing plants. Another reason for the growth in foreign R&D was the acquisition of foreign firms and their existing research laboratories.

Other company officials reported that they had increased foreign R&D in order to gain access to technologies developed outside of the United States. Only one firm reported that foreign laboratories are more productive than those in the United States, although another firm mentioned local tax incentives as a reason for its growing level of foreign R&D expenditures.

When asked about the influence of changes in currency exchange rates on the level of funds provided to foreign laboratories, over 90 percent of the R&D officials reported that exchange rates had no effect or only a slight effect. Investment in foreign R&D laboratories was viewed as a major, long-term commitment and several respondents said fluctuations in exchange rates occurred too frequently to affect funding decisions.

Impact of Current Events in Eastern Europe

One-quarter of the respondents anticipated that recent events in Eastern Europe would have an impact on the level or direction of their company's R&D program during 1991. Firms anticipating changes tended to be concentrated in specific industries. Over one-half of the firms in the other machinery and aircraft and missiles industries plan immediate R&D changes as a result of developments in Eastern Europe. Typically, these firms are strategically positioning themselves by making small investments now which will be followed by increased investments in the future. They are not looking for short-term profits, but are taking a longer-term view. In the remaining industrial categories, a much smaller fraction plan changes in 1991.

A clear majority of company officials (75 percent) said that the recent economic changes in Eastern Europe will not affect their R&D budget plans for 1991. Many of the firms without immediate plans, however, were watching the situation very closely. Some were waiting for greater stability in the political and economic situations; others planned to increase R&D, but within a five- to ten-year time frame.

Some respondents noted that Eastern Europe's greatest needs were for existing products and technologies. Some of the newest technologies were seen as too advanced to be useful under current conditions.

Numerous firms were interested in entering Eastern European markets and expected that R&D would follow as sales increased. Some of the high technology companies noted, however, that they were currently restricted in their ability to export some of their products to Eastern Europe. Changes in export licensing would be necessary before they could increase their marketing and R&D significantly in these nations.

Impact of Changes in Defense Spending

Although 68 of the 144 responding firms performed some R&D for the Department of Defense (DOD), many respondents reported that the amount of work performed was small. Others added that most of their defense research was done only with DOD funds, and not the company's. Only six firms, primarily in the electrical equipment and telecommunications industries, expected to increase spending on their company-funded, defense-related programs. Twenty-seven firms planned no change, and 26 expected to decrease their funding.

Technical Notes

Data Collection

The corporations contacted in the survey represent a special universe of major U.S. R&D firms. They included the 200 firms with the largest R&D expenditures in 1989, plus 19 firms with which NSF has had an ongoing data-collection relationship. The 200 firms with the largest R&D expenditures for 1989 were identified from data reported on the Securities and Exchange Commission's Form 10-K and published in Business Week's "R&D Scoreboard."

The original NSF Industrial Panel on Science and Technology consisted of a select group of 76 firms. Through their R&D directors, these firms have been providing information and projections to NSF for nearly a decade. All but 19 of the companies on the original panel were represented among the 200 firms with the largest R&D expenditures. [In some cases, the firms on the original NSF panel were subsidiaries of firms on the top 200 list and these divisions were deleted from the survey frame to prevent duplication.]

For each of the 76 firms in the original NSF panel, NSF used the name and address of an individual who had supplied R&D information in the past. A similar list of names and addresses was developed for the new firms from the top 200 list. The Corptech Corporate Technology Directory was used to identify the vice president for R&D (or equivalent corporate position), and telephone calls were made to verify the names, titles, and current mailing addresses.

Representatives of each firm were invited to join the NSF Industrial Panel on Science and Technology. The letter, signed by the Director, Division of Science Resources Studies, explained the purpose of the panel and its importance to NSF's policy activities. For the newly recruited companies, SRS prepared a personalized response form on which the company could record its willingness to participate and name the individual to whom future SRS communications should be addressed. For those firms that had been participants in the original NSF panel, a separate letter was prepared and sent to the individual who had represented the company in the past. Both letters included a brief description of the survey to be conducted and an Office of Management and Budget response burden statement.

Interviews with company officials began 10 days after the letters were mailed and typically lasted less than 15 minutes. Samples of the introductory letters, personalized response form, and survey information sheet are included in appendix B, along with a copy of the questionnaire used by the interviewers.

Response Rates and Nonresponse Analysis

The survey achieved an overall response rate of 65.8 percent. Only a few of the targeted corporations refused to participate for reasons of policy or confidentiality; the major causes of nonresponse were scheduling problems and respondent availability. Senior corporate officers, despite their willingness to participate in the study, were often difficult to contact by telephone. These individuals were frequently out of the office, and international travel was a major complicating factor. Such obstacles were exacerbated by a need to reschedule the data collection period from the initial date of October 1 to September 17 after the October date had been announced.

The impact of nonresponse on the estimates derived from this study cannot be directly assessed. It is possible, however, to examine the degree to which nonresponse is correlated with known factors about all companies in the survey population: Data on membership in the previous NSF panel, published 1989 R&D expenditures, 1989 sales revenues, 1989 employment levels, and Standard Industrial Classification (SIC) codes. With the exception of some variation across industry groups, analyses of these data did not reveal substantial differences in the attributes of the respondents and nonrespondents.

Overall, 65.8 percent of the companies responded to the telephone survey (table 3). Participation in the previous NSF data collection activities was not significantly associated with response on the telephone survey. Prior members of the NSF panel had a response rate of 70.7 percent, only slightly higher than that of new recruits to the panel whose response rate was 63.2 percent.

Firms responding to the survey were, on the average, slightly larger than nonresponding firms in terms of R&D expenditures, sales, and employment. Average 1989 R&D expenditure was $311.5 million for the responding firms and $259.9 million among the nonresponding firms. Sales for 1989 averaged $6,731 million in the responding firms and $5,833 million among the nonrespondents. The number of employees in the firms that responded was greater than it was in those that did not: responding firms averaged 43,768 employees while nonresponding firms averaged 38,994.

Breaking the data on R&D, sales, and employment into six discrete categories further demonstrated the strong similarity between the characteristics of responding and nonresponding firms. Response rates for the six categories of R&D expenditures ranged from 58.7 percent to 72.3 percent (table 4). The highest response rates were found among the firms with largest R&D expenditures (72.2 percent) and the lowest R&D expenditures

Table 3. Response by NSF panel status

Panel status	Total	Response	Nonresponse
		Response status	
Total	219 (100.0%)	144 (65.8%)	75 (34.2%)
Original panel members .	75 (100.0%)	53 (70.7%)	22 (29.3%)
New panel members	144 (100.0%)	91 (63.2%)	53 (36.8%)

SOURCE: National Science Foundation, SRS

Table 4. Response by category of 1989 R&D expenditures

R&D category	Total	Response status Response	 Nonresponse
Total	219 (100.0%)	144 (65.8%)	75 (34.2%)
No data	19 (100.0%)	13 (68.4%)	6 (31.6%)
$32.5 to $49.9 million	47 (100.0%)	34 (72.3%)	13 (27.7%)
$50.0 to $79.9 million	40 (100.0%)	24 (60.0%)	16 (40.0%)
$80.0 to $199.9 million	46 (100.0%)	27 (58.7%)	19 (41.3%)
$200.0 to $399.9 million	31 (100.0%)	20 (64.5%)	11 (35.5%)
$400.0 million and above	36 (100.0%)	26 (72.2%)	10 (27.9%)

SOURCE: National Science Foundation, SRS

(72.3 percent). The lowest response rates were recorded for the middle category of R&D expenditures.

Response rates for categories of 1989 sales volume were also homogeneous, varying from less than 15 percentage points from the overall average of 65.8 percent (table 5). The lowest and highest response rates were obtained from the companies with the largest and second largest sales volume, respectively.

The relationship between response rates and number of employees was similar to that between response rates and sales volume (table 6). Response rates were highest for the companies with the largest number of employees and lowest among those companies with the second largest number of employees; response rates for all other size categories fell in between.

The lack of any systematic pattern across categories supports the view that differences among firms were not linked to their attributes.

The only category in which there was substantial variation was that of the industry group (table 7). Response rates between 67.4 percent and 89.3 percent were obtained from six industry groups: Petroleum refining and extraction, industrial and other chemicals, electrical equipment, aircraft and missiles, scientific instruments, and "other" industries. In three industries--pharmaceuticals, computer and office equipment, and computer services--the response rates fell between 33.3 percent and 46.7 percent. In the remaining industry, other machinery, the response rate was 53.8 percent.

Table 5. Response by category of 1989 sales volume

		Response status	
Sales category	Total	Response	Nonresponse
Total	219 (100.0%)	144 (65.8%)	75 (34.2%)
No data	2 (100.0%)	1 (50.0%)	1 (50.0%)
Less than $599 million	40 (100.0%)	25 (62.5%)	15 (37.5%)
$600 to $1,599 million	41 (100.0%)	26 (63.4%)	15 (36.6%)
$1,600 to $3,399 million	29 (100.0%)	13 (69.1%)	42 (31.0%)
$3,400 to $6,399 million	44 (100.0%)	23 (52.3%)	21 (47.7%)
$6,400 million and above	50 (100.0%)	40 (80.0%)	10 (20.0%)

SOURCE: National Science Foundation, SRS

Table 6. Response by category of 1989 employment

Number of employees	Total	Response Status: Response	Response Status: Nonresponse
Total	219 (100.0%)	144 (65.8%)	75 (34.2%)
No data	2 (100.0%)	1 (50.0%)	1 (50.0%)
Less than 5,999	50 (100.0%)	34 (68.0%)	16 (32.0%)
6,000 to 17,999	42 (100.0%)	26 (61.9%)	16 (38.1%)
18,000 to 29,999	43 (100.0%)	26 (60.5%)	17 (39.5%)
30,000 to 59,999	40 (100.0%)	23 (57.5%)	17 (42.5%)
60,000 and above	42 (100.0%)	34 (81.0%)	8 (19.1%)

SOURCE: National Science Foundation, SRS

Table 7. Response by industry group

Industry group	Response status Total	 Response	 Nonresponse
Total	219 (100.0%)	144 (65.8%)	75 (34.2%)
Petroleum refining and extraction	11 (100.0%)	8 (72.7%)	3 (27.3%)
Industrial and other chemicals	28 (100.0%)	25 (89.3%)	3 (10.7%)
Pharmaceuticals	21 (100.0%)	9 (42.9%)	12 (57.1%)
Computer and office equipment	21 (100.0%)	7 (33.3%)	14 (66.6%)
Other machinery	13 (100.0%)	7 (53.8%)	6 (46.2%)
Electrical equipment	25 (100.0%)	19 (76.0%)	6 (24.0%)
Aircraft and missiles	16 (100.0%)	14 (87.5%)	2 (12.5%)
Scientific instruments	23 (100.0%)	17 (73.9%)	6 (26.1%)
Computer Services	15 (100.0%)	7 (46.7%)	8 (53.3%)
Other industries	46 (100.0%)	31 (67.4%)	15 (32.6%)

SOURCE: National Science Foundation, SRS

Appendixes

A. Definitions of Industry Groups

B. Survey Documents

Appendix A

Definitions of Industry Groups

[Note: SIC codes are given in parentheses]

Petroleum refining and extraction (13,29) - Includes firms primarily engaged in producing crude petroleum or natural gas, and those engaged in petroleum refining.

Industrial and other chemicals (28 less 283) - Includes firms producing basic chemicals and those manufacturing products by predominantly chemical processes. Excludes firms in pharmaceuticals industry group.

Pharmaceuticals (283) - Includes firms primarily engaged in manufacturing, fabricating, or processing medicinal chemicals and pharmaceutical products.

Computer and office equipment (357) - Includes firms primarily engaged in manufacturing electronic computers.

Other machinery (35 less 357) - Includes firms primarily engaged in manufacturing industrial and commercial machinery and equipment. Excludes firms manufacturing electronic computer equipment.

Electrical equipment (36) - Includes firms primarily engaged in manufacturing machinery, apparatus, and supplies for the generation, storage, transmission, transformation, or utilization of electrical energy.

Aircraft and missiles (372 and 376)- Includes firms primarily engaged in manufacturing or assembling complete aircraft or guided missiles, their engines, propulsion units or other parts.

Scientific instruments (38) - Includes firms engaged in manufacturing instruments for measuring, testing, and controlling; optical instruments and lenses; surveying and drafting instruments; hydrological, hydrographic, meteorological, and geophysical instruments; search, detection, navigation, and guidance systems and equipment; surgical, medical, and dental instruments, equipment and supplies; ophthalmic goods; photographic equipment and supplies; and watches and clocks.

Computer services (737) - Includes firms providing computer programming services, prepackaged computer software, integrated systems design, data preparation and processing services, information retrieval services, computer facilities management services, computer rental and leasing, computer maintenance and repair, or other computer related services.

Other industries - Includes all other firms surveyed that are not covered by the industry groups given in this list.

Appendix B

Survey Documents

Page

NSF Cover Letter.................................... 25

Letter of Invitation................................ 26

Response Form....................................... 28

Issues and Information to be Addressed.............. 29

Interviewer's Questionnaire......................... 30

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

September 6, 1990

Mr. John Doe
V.P. of Research & Development
ABC Corporation
New York, NY

Dear Mr. Doe:

I would like to invite you to become a member of the National Science Foundation's (NSF) Industrial Panel on Science and Technology. In the past, NSF has turned to corporate R&D directors on this panel to develop forecasts of industrial R&D performance and guide the formulation of broad-reaching national policies related to science and technology.

The time demands on the members of the Industrial Panel on Science and Technology will be minimal. The Foundation intends to contact the panel two or three times each year with short informational requests, each one requiring not more than 15 minutes.

Beginning the week of October 1, we will be contacting the panel for a short (ten-minute) telephone survey on industrial R&D spending. During the course of the interview we will be asking you for information about your overall R&D expenditures and to verify some general corporate statistics that we have collected. I have enclosed a list of the specific questions that we will be asking.

If you will be unable to participate at that time, would you please direct us to one of your staff members who could provide us with data on corporate R&D spending? We are looking for a representative from your company who can provide information about science and technology issues (including R&D spending and personnel) at the corporate level.

Your participation in this project is greatly appreciated and your company's perspectives are extremely valuable to us. Section 14(i) of the National Science Foundation Act of 1950, as amended, provides that the information you supply will be kept confidential.

If you have any questions about the panel, please contact Mr. John Gawalt of my staff at (202) 634-4648. He will be assisted in the development of the panel and the first telephone inquiry by Dr. Howard Garrison of Applied Management Sciences.

We are very interested in your participation and have enclosed a letter and stamped return envelope for you to indicate your response and any other instructions for future contacts.

Sincerely yours,

Daniel Melnick
Director, Division of Science
Resources Studies

Enclosures

ABC Corporation
New York, NY

September 14, 1990

Howard H. Garrison, Ph.D.
Applied Management Sciences, Inc.
962 Wayne Avenue
Silver Spring, MD 20910

Reference: NSF Industry Panel on Science and Technology

Dear Dr. Garrison:

I am responding to the invitation to participate on the NSF Industry Panel on Science and Technology.

____I will participate.

____I have asked one of my staff members to participate.

____
Name

____
Title

(   )__________________________
Telephone

____My company is unable to participate.

Sincerely yours,

John Doe
V.P. of Research & Development

Issues and Information
To be Addressed on Fall 1990 Query of
NSF Industrial Panel on Science and Technology

- Percentage change in expenditures for R&D performed in domestic labs
  - 1989 to 1990
  - 1990 to 1991 (anticipated)
- Percentage allocation of R&D expenditures between domestic and foreign labs (for 1985 and 1990) and major reasons for changes
- Anticipated impact of changes in Federal defense spending on:
  - defense-related R&D financed with company funds
  - personnel and facilities currently dedicated to defense-related R&D
- Anticipated impact of changes in Eastern Europe on the level and direction of company's R&D programs during 1991
- Verification of published data (to establish consistent frame of reference for corporate units)
  - Final month of corporation's fiscal year
  - Expenditures for R&D performed in domestic labs (1985 and 1989)
  - 1989 Domestic net sales
  - 1989 Total company employment

Note: Public reporting burden for this collection of information is estimated to vary from 15 to 45 minutes per company response, with an average of 30 minutes per company response, including time for gathering data needed and responding by mail, telephone, or FAX. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Herman G. Fleming, National Science Foundation, 1800 G Street, Washington, DC 20550, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

Dear Dr./Mr.Ms. ______________________:

My name is ____________________________ and I am calling on behalf of the National Science Foundation in Washington, D.C. We are conducting a brief study for the National Science Board's committee on Industrial Research and Development regarding R&D expenditures.

Last week we sent you a letter explaining a little about this study? Did you receive it?

(If NO, I'm sorry yours didn't reach you. It was a brief letter we sent so people would know that we would be calling.)

The entire interview should take no more than 15 minutes. Is this a convenient time?

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

September 6, 1990

Mr. John Doe
V.P. of Research & Development
ABC Corporation
New York, NY

Dear Mr. Doe:

I would like to thank you for your past participation in our Industrial Panel on Science and Technology. The information from corporate R&D directors like yourself enables the Foundation to develop forecasts of industrial R&D performance and has proven very useful in the formulation of broad-reaching national policies related to science and technology.

Beginning the week of October 1, we will be contacting the panel for a short (ten-minute) telephone survey on industrial R&D spending. During the course of the interview we will be asking you for information about your overall R&D expenditures and to verify some general corporate statistics that we have collected. I have enclosed a list of the specific questions that we will be asking.

Your cooperation with this project is greatly appreciated and your company's perspectives are extremely valuable. Section 14(i) of the National Science Foundation Act of 1950, as amended, provides that the information you supply will be kept confidential.

Sincerely yours,

Daniel Melnick
Director, Division of Science
Resources Studies

Enclosures

1. Before we begin, may I take a moment to verify some general information about your company that we have collected from your company's public reports? [NOTE: The data on THIS PAGE refer to WORLDWIDE operations]

   a. Does your company's fiscal year end in _________?

      1. YES

      2. NO, the correct month is ________.

   b. Were your company's 1989 net sales $_________ million?

      1. YES

      2. NO, they were $_________ million.

   c. Your total company employment for 1989 was _________?

      1. YES

      2. NO, total employment was _________.

   d. Your 1989 R&D expenditures were $_________?

      1. YES

      2. NO, they were $_________ million.

   e. Your 1985 R&D expenditures were $_________?

      1. YES

      2. NO, they were $_________ million.

   f. Do the 1985 and 1989 R&D expenditures represent the same corporate entity?

      1. YES, they represent the same company

      2. NO, acquisitions or divestitures have taken places.

         _If_ no, please describe the major changes

         ____

         ____

         ____

         ____

My first two questions are about your company's R&D budget plans for 1990 and 1991 and how they've changed from the previous year. In your responses, please consider only monies provided by your company. Please exclude monies from outside sources such as other companies or the Federal government.

2. For fiscal year 1990, will your company's expenditures for research and development activities performed in your domestic R&D labs increase, decrease, or remain unchanged when compared to your expenditures during 1989?

   I. DON'T KNOW

   II. REFUSAL

   III. INCREASE. If increase,

      i. What percentage growth is expected? _________%

   IV. REMAIN UNCHANGED

   V. DECREASE. If decrease,

      i. What percentage decline is expected? _________%

   VI. What are the principle factors influencing this (increase/decrease/stability)? CHECK ALL THAT APPLY.

      a. Sales/profit levels
      b. Long-range plans/goals
      c. Real cost of capital
      d. Inflation
      e. Mergers/acquisitions
      f. Tax laws
      g. Development of new technologies
      h. Growth projections for new markets
      i. Other (specify) ____

      ____

3. Now looking ahead to fiscal year 1991, will your company's expenditures for research and development performed in your domestic R&D labs increase, decrease, or remain unchanged when compared to your planned expenditures for 1990?

   I. DON'T KNOW

   II. REFUSAL

   III. INCREASE. _If_ increase,

      i. What percentage increase is anticipated? _________%

   IV. REMAIN UNCHANGED.

   V. DECREASE. _If_ decrease,

      i. What percentage decline is anticipated? _________%

   VI. What are the major factors influencing this decline (increase/decrease/stability)? _CHECK ALL THAT APPLY_.

      a. Sales/profit levels
      b. Long-range plans/goals
      c. Real cost of capital
      d. Inflation
      e. Mergers/acquisitions
      f. Tax laws
      g. Development of new technologies
      h. Growth projections for new markets
      i. Other (specify) ______________________________________

      ____

A topic receiving increased attention from Federal policymakers and analysts is the extent to which U.S. companies are performing R&D in their own facilities located outside the United States.

(For this question, as for the two previous, please include only monies provided by your company. Do not include monies provided by outside sources such as other companies or the Federal government.)

4.1 Considering the money that your company spent in 1989 performing R&D in your own labs world-wide, what percentage of these funds was spent to support R&D in your domestic labs and what percentage was spent in support of your foreign labs?

(Domestic labs are those located in the 50 States and the District of Columbia, all others are considered foreign.)

a. __________ percent spent in domestic labs.

b. __________ percent spent in foreign labs.

100%

c. No foreign labs

d. DON'T KNOW

e. REFUSAL

4.2 What was the distribution in 1985?

a. __________ percent spent in domestic labs

b. __________ percent spent in foreign labs.

c. No foreign labs

d. DON'T KNOW

e. REFUSAL

If 4.1b is not equal to 4.2b

4.3 What were the major factors influencing this change in funding for foreign labs? CHECK ALL THAT APPLY.

a. Currency exchange rates

b. Availability of personnel or expertise

c. Entry into new markets

d. Legal requirements

e. Other (specify) ____

____

4.4 How much influence have fluctuating currency exchange rates had on your company's funding of foreign labs.

- a. No influence at all
- b. Slight influence
- c. Moderate influence
- d. Great influence
- e. DON'T KNOW
- f. REFUSAL

5. Does your company perform R&D for the Department of Defense?

- A. YES

  If YES,

  - I. What impact do you anticipate reductions in Federal defense spending will have on defense-related R&D programs which your company finances with its own funds?
    - a. INCREASE

      If a,

      - i. by what percent? _____%
    - b. REMAIN UNCHANGED
    - c. DECREASE

      If c,

      - i. by what percent? _____%
    - d. DON'T KNOW
    - e. REFUSAL
  - II. Do you expect that some of your defense-supported R&D personnel will be shifted to non-defense R&D activities?
    - a. YES
      - i. If Yes, what percent of your defense-supported personnel will be shifted? _____%
    - b. NO
- B. NO

Significant changes have occurred in Eastern Europe during the past year. We would now like to get your thoughts on the impact these changes might have on your company's R&D program.

6. Do you anticipate that these new economic opportunities will have an impact on the level or direction of your company's R&D program during FY 1991?

    a. YES.

        i. If yes, what major changes do you anticipate?

        ____

        ____

        ____

        ____

    b. NO

That is our final question. Thank you for your cooperation.

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

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NSF 91-306